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**DRAFT**

**An Initial Overview of Delta Science, the Delta Science Program,  
and the Roles of the Delta Independent Science Board**

**A Report of the Delta Independent Science Board  
January 9, 2012**

**Summary**

The Delta Independent Science Board (DISB) met with Delta scientists, stakeholders, and legislative staff during its meetings of October 20-21 and December 1-2, 2011 to gain a broad overview of how, and how well, Delta science works. This memo summarizes and elaborates on the key findings from those meetings. This initial overview will provide key background information for the DISB as it reviews specific scientific programs that support adaptive management and prepares its review of the Delta Science Plan over the coming year.

**Key Findings from the Initial Overview**

1. Delta science -- the myriad ways in which science is conducted within agencies, universities, and nongovernmental think-tanks -- needs greater financial support, more cohesion, improved monitoring and information systems, better systems models, and more effective ways to bring the knowledge gained to the public and policy makers.
2. The Delta Science Program (DSP) has an excellent reputation and track record. It leads the process of identifying critical scientific issues and facilitates the review and synthesis of Delta science. More resources, however, are needed so that it can address mounting challenges and assure the quality of science required to effectively manage the Delta.
3. The development and implementation of adaptive management plans will require significant changes in how science is done in the agencies and will need some coordination by the DSP.
4. Progress on resolving the ambiguities in the coequal goals of assuring “water reliability” and “protecting, restoring, and enhancing the Delta ecosystem” will improve the effectiveness of Delta science.
5. Neither the producers nor users of Delta science appear to be looking far enough into the future and giving sufficient consideration to the implications of inevitable environmental changes and uncertainties over the next fifty years.
6. Agency scientists and stakeholders are not adequately distinguishing the differences in the mandates of the DSP and DISB, but their confusion did lead to some critical questions concerning the relationship between the DSP and DISB that need to be worked through.

This report elaborates on these key findings and suggests some steps toward resolving some of the issues they raise.

## 1 **Background**

2 The Delta Independent Science Board initiated an overview of Delta science during its  
3 meetings on October 20-21 and December 1-2, 2011. Having spent its first year assessing  
4 stressors in the Delta and reviewing various drafts of The Delta Plan at the request of the  
5 Delta Stewardship Council, the DISB held these meetings pursuant to its legislative  
6 mandate to review science programs.<sup>1</sup> These meetings provided the DISB with a broad,  
7 initial look at how, and how well, Delta science is working according to scientists from  
8 various research programs and a broad range of users of Delta science.

9 Prior to the October meeting, DSP staff identified the many scientific programs  
10 underway for the Delta and solicited information about how the programs were  
11 incorporating adaptive management. Information was obtained from programs involved in  
12 water supply (6), ecosystem restoration (15), water quality (14), and risk reduction (8).  
13 During the October meeting, the Board listened to and queried scientists working in these  
14 areas. In a separate session, the DISB met with Michael Machado, Executive Director of the  
15 Delta Protection Commission, and Jeffrey Michael, lead author of the Delta Protection  
16 Commission Economic Sustainability Plan.

17 Prior to DISB's December meeting, the DSP staff invited key users of Delta science to  
18 attend, including: representatives of water and environmental agencies; stakeholder  
19 groups including water contractors, a municipal utility, and environmental organizations;  
20 and staff of key legislators and legislative committees. Each received a series of key  
21 questions to address with respect to how well science is working and being communicated.  
22 During the December meeting, the DISB met with representatives from seven agencies,  
23 representatives from 17 stakeholder groups, and four staff from the offices of legislators  
24 and legislative committees.

25 The DISB was impressed by the willingness of both scientists and users of science to  
26 spend several hours discussing Delta science, how it can be made more effective, and how  
27 it can be better communicated to managers, policy makers, and the public. The  
28 representatives of producers and users of science were well prepared and came with  
29 important messages to impart and discuss. Many provided written comments as well.  
30 While members of the DISB learned more than we summarize in this memo, the Board  
31 finds the following points to be especially important to convey to Delta scientists and  
32 managers, the Delta Stewardship Council, other policy makers, and the public.

### 33 **1. Sustaining and Strengthening Delta Science as a Whole**

34 The State Legislature clearly expects science to play a very significant role in resolving the  
35 intense conflicts between using water and sustaining the quality of California's unique  
36 Delta environment. The Delta Reform Act specifies the practice of adaptive management in  
37 which science plays a key role. The Act also established the Delta Science Program to  
38 coordinate Delta science and the Delta Independent Science Board to oversee Delta science.  
39 Like the Delta ecosystem, Delta science is complex. It is conducted and brought to policy  
40 makers and the public through a myriad of intertwined research programs of water and  
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<sup>1</sup> The Delta Reform Act created The Delta Independent Science Board (DISB) [Water Code Section 85280 (a) (3)] to "provide oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Delta through periodic reviews of each of those programs that shall be scheduled to ensure that all Delta scientific research, monitoring and assessment programs are reviews at least every four years."

1 environmental agencies, universities, and nongovernmental think tanks, with many efforts  
 2 assisted by scientific and engineering consulting firms. All parties who spoke with the DISB  
 3 support greater efforts to: improve the quality of monitoring and modeling the Delta;  
 4 increase exchanges among scientists; strengthen the cohesion in the science that is being  
 5 produced; and improve the communication of scientific knowledge to legislators, policy  
 6 makers, stakeholders, and the public at large.

7 The parties brought before the DISB praised existing efforts by the DSP to encourage  
 8 shared learning and synthesis. The independent reviews, workshops, and seminars of the  
 9 DSP, a part of their legislative mandate, play a critical role in the process. The DSP's  
 10 biennial Bay-Delta Science Conferences and the State of the San Francisco Estuary  
 11 Conferences under the auspices of the San Francisco Estuary Partnership serve a vital role  
 12 in bringing many researchers together to share information and discuss future needs. And  
 13 yet, many who spoke before the DISB felt that still more scientific interchange was needed.  
 14 The DISB looks forward to supporting the creation of additional innovative opportunities  
 15 to bring scientists together to challenge each other's assumptions and findings, find  
 16 common ground, and work toward a stronger cohesion in the scientific community.

17 While there are clearly many opportunities for improvement, many of those who  
 18 spoke to the DISB expressed concern that the shrinking State budget and constraints on  
 19 hiring were seriously impinging on the existing quality and quantity of science, let alone  
 20 addressing the difficulties of working together and communicating science effectively  
 21 beyond those who needed it for their day-to-day management decisions. Clearly, to us, the  
 22 expectations for science spelled out in the Delta Reform Act cannot be met without  
 23 sufficient, reliable funding for core programs of the State and Federal governments.

24 Some of those who spoke to the DISB expressed concern that hiring freezes and  
 25 other issues were leading to a greater dependence on science and engineering consultants,  
 26 rather than conducting in-house research with existing personnel. The practice of hiring  
 27 consultants accomplishes an immediate task of providing plans, reviews, and assessments,  
 28 but does not build and sustain the scientific capacities of the agencies that must implement  
 29 the new science and monitoring, and engage with it over the long run to improve  
 30 management. The DISB is concerned that the balance of activity has shifted away from  
 31 scientists in the agencies.

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### 33 **2. The Delta Science Program**

34 All parties who addressed the role of the DSP were highly supportive of the leadership role  
 35 the DSP plays in facilitating scientific reviews, providing synthesis workshops, helping  
 36 identify research priorities, and taking a broader and longer term perspective on the Delta.  
 37 At the same time many parties noted that even greater effort is needed to assure  
 38 improvements in systemic models and their appropriate use, coordination of monitoring  
 39 activities, maintenance and assurances of the quality of data, and facilitation of access to  
 40 data.

41 In a separate memo, the DISB has expressed its concern about the instability of  
 42 funding for the DSP.

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### 44 **3. Adaptive Management**

45 The Delta Reform Act mandates the use of adaptive management (AM) and defines it as "a  
 46 framework and flexible decision making process for ongoing knowledge acquisition,  
 47 monitoring, and evaluation leading to continuous improvements in management planning

1 and implementation of a project to achieve specific objectives” [8502]. In its interviews, the  
 2 DISB found broad support for the general concept of AM but noted considerable confusion  
 3 with respect to how it could be applied to particular programs. Furthermore, the DISB has  
 4 become increasingly aware that AM connotes different things in accordance with the  
 5 diverse background, goals, and perceptions of scientists, policy makers, and stakeholders.

6 Chapter 2 of the Delta Plan describes AM as a structured and iterative process to  
 7 optimize decision making in the face of uncertainty. It does this by reducing this  
 8 uncertainty over time through the use of effective monitoring approaches. The challenge  
 9 that science programs in the Delta currently face (and will continue to face in future  
 10 decades) in using the AM approach lies in finding the correct balance between using the  
 11 best existing knowledge to achieve a current goal and gaining knowledge to improve  
 12 management in the future. Because AM is both a scientific and a management process,  
 13 hypotheses testing and experimental frameworks are combined with management  
 14 strategies to best achieve the desired goals.

15 At the December DISB meeting, a discussion arose with respect to the experimental  
 16 nature of AM and the need for an occasional “bold experiment” to better understand how  
 17 particular aspects of the Delta system work. This initiated a discussion as to whether Delta  
 18 politics, California water politics, indeed California politics are sufficiently mature to  
 19 integrate management with scientific learning. In the conventional formulation, managers  
 20 use the best science to do the right thing, not to experiment, and to learn how to respond to  
 21 potential future problems as well. AM requires public trust, and building sufficient trust  
 22 requires greater communication with the public.

#### 23 24 **4. Science and the Ambiguities of the Coequal Goals**

25 Several parties expressed frustrations that are tied to the ongoing difficulties in coming to a  
 26 common vision of the “Delta as a place”, and hence what tradeoffs might be considered  
 27 among diverse goals. For example, several parties asked if Delta ecological restoration can  
 28 mitigate for other environmental changes resulting from changes in the in-take point,  
 29 timing, quantity, or reliability of water deliveries. While this is partly a scientific question, it  
 30 is also closely tied to the issue of what kind of Delta is envisioned in the future (for example  
 31 in 50 years) and how the coequal goals of “providing a more reliable water supply for  
 32 California and protecting, restoring, and enhancing the Delta ecosystem” might “be  
 33 achieved in a manner that protects and enhances the unique cultural, recreational, natural  
 34 resource, and agricultural values of the Delta as an evolving place” (CA Water Code SS  
 35 85054). “Water reliability,” of course, is also vague, but at least water quantities, qualities,  
 36 and times and places can be defined. The DISB recognizes that the legislation specifically  
 37 calls for these coequal goals but attaining knowledge and implementing programs at all  
 38 levels requires more clarification, information, and leadership.

#### 39 40 **5. Climate Change and Scientific Foresight**

41 The Board was concerned when it heard that many scientists and managers within water  
 42 and environmental agencies are not able to look very far into the future. Myopic decisions  
 43 during times of rapid environmental change can exacerbate problems, reducing the  
 44 effectiveness of restoration activities. One participant argued that without considering  
 45 climate change and developing AM strategies to deal with it, we will just be monitoring a  
 46 declining ecosystem. Many felt the DISB could play an important role through its reviews  
 47 and other efforts by stressing the long term.

## 1 **6. The Roles of the DISB and the DSP**

2 While the legislative mandates for the DISB and DSP are clear, many of those who  
3 participated in the October and December meetings conflated the roles of DSP and DISB.  
4 The DISB was inappropriately credited for work done by the DSP and asked to do more of  
5 the same. While the DISB reviews the progress of Delta science, including the activities of  
6 the DSP, and provides guidance, it is the DSP that facilitates peer review and initiates and  
7 facilitates much needed opportunities for the synthesis of Delta science.

8         Nevertheless, the discussions around the roles of the DISB and DSP did initiate an  
9 interesting discussion. Achieving good scientific understanding is a process. How well the  
10 process is working and how it might be improved cannot be determined by looking simply  
11 at the products of science. This is especially true for the role of science in adaptive  
12 management. The DISB cannot effectively review and guide the scientific process without  
13 also having some representative participation in the process or other way of obtaining an  
14 independent insight into the processes. Just how this dilemma might be best addressed will  
15 be an ongoing topic as the DISB engages in the review of programs over the coming year.  
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